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OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

Memorandum

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SUBJECT: Initial Caneberry Biological and Economic Benefits Assessment for Azinphos-methyl

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Summary

Caneberries are a high-value perennial crop with approximately 25,000 acres grown in the western states of Washington, Oregon, and California (the major production areas). Based on available published data and personal communications with crop experts, BEAD believes that limited impact will result from extending the restricted entry intervals on azinphos-methyl for caneberries as long as there is an equally efficacious organophosphate alternative available. Adequate alternatives appear to be available and are currently efficacious for most uses (although pest resistance could develop in the future). The only exception is in Oregon for control of the raspberry crown borer in blackberries where azinphos-methyl is considered a critical component for its control. BEAD believes that the most likely outcome resulting from extending the restricted entry intervals is that growers will switch to existing alternative pest control methods for all other pests.

Background

Caneberries is the general term for *Rubus* spp., which are commonly called raspberries and blackberries. When picked, raspberries leave the receptacle behind resulting in a cup-shaped fruit. Blackberries on the other hand, retain the receptacle within the fruit and the fruit are not cup-shaped. Raspberries are in *Rubus* subgenus *Idaeobatus* and blackberries are in the subgenus *Eubatus.* Caneberries have perennial crown and root systems and biennial shoots. The first year of shoot growth is entirely vegetative and termed the primocane. Primocanes are dormant through the winter. During the second year, these shoots produce lateral branches bearing flowers and are termed floricanes. The floricanes produce the second year's fruit. The floricanes die at the end of the growing season and must be removed by pruning (USDA, 2000).

Production

Raspberries: In 1999 in the United States raspberries (black and red) were grown on 15,400 acres. There are approximately 9,500 acres in Washington, 4,100 acres in Oregon, and 1,800 acres in California.

Blackberries: In Oregon there were 5,850 acres of blackberries grown in 1999. Production appears to be stable (Oregon Ag. Stat. Service, 2000).

Information on the total acreage in the U.S. for both of these crops is not available due to the very small acres grown in several other states where production is not recorded.

Table 1. Caneberry crops acreage, yield, and value in 1999.

Crop and State	Acreage Harvested	Yield per acre (pounds)	Value of Utilized Production ($ 1,000)
Raspberries, Washington	9,500	7,300	48,291
Raspberries, Oregon	4,100	7,190	15,122
Raspberries, California	1,800	10,200	27,330
Blackberries, Oregon	5,850	6,740	27,140

Source: Oregon Ag. Stat. Service, 2000.

Cultural practices which involve hand labor include irrigation, hand weeding, pruning and training of vines, and hand harvest (see Table 4). Caneberries are generally irrigated with sprinklers or trickle irrigation in the Western U.S. With trickle irrigation, inter-row spaces remain firm and dry and the root zone remains moist at all times. Weed control between the rows is accomplished largely by routine cultivation during the growing season. Weed control within the rows is accomplished using, hand weeding or pre-emergent herbicides usually applied in the spring and contact herbicides as needed. Scouting for pests also takes place during the spring, summer, and fall. Pruning and training of the vines is performed by hand. In the fall after harvest, the primocanes are trained on the trellis and the old floricanes are cut from the trellis. They are then chopped and disced back into the soil. Some growers train their vines in the spring instead of the fall. Blackberries and raspberries can be machine or hand harvested.

Use of Azinphos-methyl on Blackberries

The only reported use of azinphos-methyl was on 11 percent of blackberries in 1997 in Oregon (Blackberries Crop Profile, 1999). Use of azinphos-methyl ranked fourth among control alternatives for Oregon blackberry growers in 1999 with approximately 300 total pounds applied. Table 2 below illustrates the control alternatives for blackberries.

Table 2. Blackberry chemical control alternatives.

Chemical Control	% Area Treated	Total Pounds Applied (1,000 lbs)
Carbaryl	29	2.3
Esfenvalerate	25	0.1
Diazinon	16	1.1
Azinphos-methyl	11	0.3
Bt (*Bacillus thurg*)	3	-
Petroleum distillate	3	1.2

Source: USDA NASS Agricultural Chemical Usage July 2000
- Indicates data not provided

There was no reported use of azinphos-methyl on raspberries in Oregon, California, or Washington in 1999.

BEAD has been told that a critical use of azinphos-methyl is needed in Oregon for control of the raspberry crown borer (Pennisetia marginata Harris) in blackberries. All other pests that azinphos-methyl is used on have alternative products available. This pest has a two year life-cycle. While not widespread it can be a devastating pest causing losses of up to 50% of the plant in heavily infested fields in the absence of a targeted control program (communication with local experts).

Target Pest

The raspberry crown borer is a moth about 1" long resembling a yellow-jacket wasp. These moths emerge July through September, lay eggs on brambles and larvae hatches through early October. Larvae overwinter at or below the soil line under the bark of the cane. The next summer, the larvae feeds in the crown at the base of canes, weakening canes and reducing yield. A reduction in year-to-year yield is a sign that the planting is infested.

Raspberry crown borer infestations are treated with an azinphos-methyl drench applied to the base of the plant and the soil, typically in early to mid-March. The treatment may have to be repeated after October 1 and are continued for two years because of the pest's life-cycle. The only other registered effective product for control of raspberry crown borer is diazinon. However, repeated use of one pesticide may lead to resistance problems. Because of this Oregon recommends rotating these two products on infested acreage. The only cultural control listed for this pest is removal of all wilted canes in June and July. This will reduce the number of moths flying to other plants but does not provide effective control. No effective biological control agents are described for this pest.

Impacts

The current risk assessment on the web has calculated the risk reduction achieved by extending the REIs. Please refer to the occupational and residential human health risk assessment on the Agency's website (http://www.epa.gov/pesticides/op) for information concerning the worker risks associated with the restricted entry intervals for this chemical. Current restricted-entry intervals are given in Table 3.

Table 3. Azinphos-methyl Restricted Entry Intervals for Caneberries.

Current Label REI	PHI
4 or 5 days. 5 days if rainfall is under 25 inches per year	14 days (foliar), 4 days (soil or lower cane directed)

Biological Assessment

Oregon is the only state that has indicated that azinphos-methyl is a key component of their pest management strategy for control of raspberry crown borer. In Oregon, raspberry crown borer is treated with a drench application to the base of the canes with azinphos-methyl from October 1 to March 1. A REI of more than 14 days would essentially eliminate the use of this product because of the scouting, training of canes, weeding, and hand harvesting operations that must occur for proper management of the crop.

Because treatments against raspberry crown borer using azinphos-methyl would be a basal drench treatment, it is likely that the estimated restricted entry interval for this use would be significantly shorter than that calculated for a foliar application. Changes in PHI would not be a factor in the use of azinphos-methyl. Entomologists in Oregon suggest that in blackberry fields heavily infested with raspberry crown borer may result in yield losses of 50%. All other pests that azinphos-methyl is used on have other products available.

Economic Assessment

BEAD anticipates that if the REI is increased past seven days that growers in Oregon will use diazinon to control raspberry crown borers instead of azinphos-methyl. Diazinon is a currently registered and equally efficacious alternative for control of this pest. Therefore, additional yield losses would not be expected with the use of diazinon due to raspberry crown borer. Diazinon is widely used for numerous pests in blackberries. In Oregon diazinon was used on 15% of the acres (Crop Profile for Blackberries in Oregon, 1999).

However, there is concern among blackberry growers in Oregon that resistance to diazinon by the raspberry crown borer may occur. Azinphos-methyl is currently rotated with diazinon to reduce the likely-hood of resistance in raspberry crown borer. If this is realized in the future an alternative such as azinphos-methyl would be of key importance for the management of this pest.

Given the efficacious nature of diazinon, BEAD anticipates no reduction in gross revenues for blackberry growers in Oregon, unless resistance occurs, as the treatment cost of diazinon is significantly less than that of azinphos-methyl (Table 4). Because of the price differential between the two products azinphos-methyl is in areas of heavy raspberry crown borer infestation to maximize control and reduce the likelihood of resistance occuring.

Table 4. Comparative Pricing (1999) of Raspberry Crown Borer Insecticides.

Insecticide and rate (lbs ai/acre/year)	Price per acre per year (dollars)
Azinphos-methyl is applied at 2.0 lbs	$ 36.80
Diazinon is applied at 2.0 lbs	$ 17.85

USDA Agricultural Statistics 2000. Table 9-36.

INFORMATION SOURCES

Crop Profile for Blackberries in Oregon, Revised September 1999. USDA Crop Profiles. Prepared by P. Thomson, W. Parrott, and J. Jenkins.

Crop Profile for Raspberries in Oregon, Revised September 1999. USDA Crop Profiles. Prepared by P. Thomson, W. Parrott, and J. Jenkins.

Crop Profile for Caneberries in California, Prepared February 2000. USDA Crop Profiles. Written by Jim and Kristen Farrar.

Oregon Agricultural Statistics Service. 2000 Berry production.

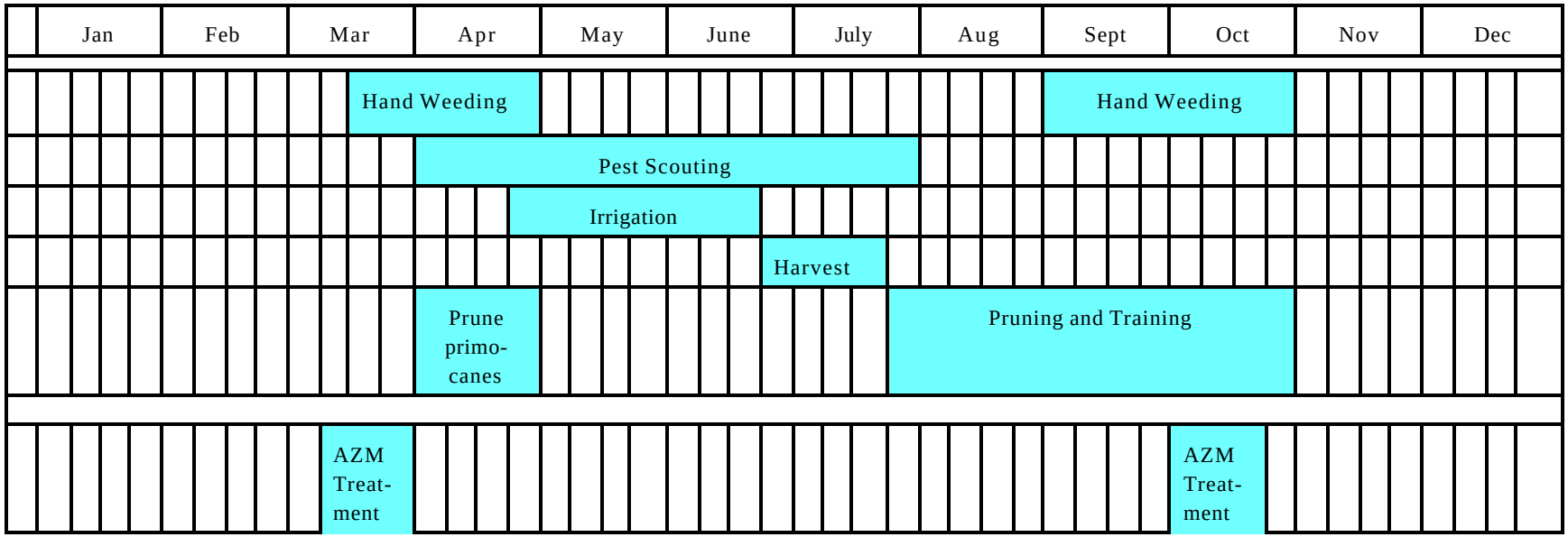
Pest Management Guide for Commercial Small Fruits, 2001. EB1491. Cooperative Extension, Washington State Univ. Edited by Susan B. Roberts.

1999 Annual Pesticide Use Report, California Dept. of Pest. Reg., 1999. Azinphos-methyl.

USDA, Agricultural Statistics 2000. Table 9-36. Insecticide prices.

USDA, National Agricultural Statistics Service. Agricultural Chemical Usage for Raspberries. 1999.

Table 5. Cultural Practices, Proposed Restricted Entry Interval, and Typical Azinphos-methyl (AZM) Timing In Raspberries In Oregon.



Current REI for azinphos-methyl is 4 or 5 days.